What is claimed is:

1. A method of measuring air content in a sample fluid comprising:

determining a base volume change between zero or a negative pressure and a positive pressure in a chamber;

determining a sample volume change between zero or the negative pressure and the positive pressure in the chamber with a sample fluid; and

determining air content of the sample fluid by comparing the sample volume change and the base volume change.

2. The method of claim 1, wherein the chamber has an inlet valve, an outlet valve, and an assembly connected to a pressure source.

3. The method of claim 2, wherein the assembly comprises a cassette piston.

4. The method of claim 2, wherein the pressure source comprises a motor connected to the piston and generates negative pressure.

5. The method of claim 2, wherein the pressure source comprises a spring connected to the piston and generates positive pressure.

6. The method of claim 2, wherein the sample fluid flows into the chamber when the pressure source generates negative pressure.

7. The method of claim 2, wherein the chamber is part of an infusion pump.

8. The method of claim 1, wherein the chamber is closed at the positive pressure.

9. The method of claim 2, wherein the inlet valve and the outlet valve are closed when the pressure source generates positive pressure.

10. The method of claim 3, wherein the determination of the base volume change and the sample volume change includes determining a position of the cassette piston.

11. The method of claim 10, wherein the determination of the position of the cassette piston includes using an optical position sensor.

12. The method of claim 1, wherein the determination of the base volume change is repeated for one or more times and a lower than average value is selected as the base volume change.

13. The method of claim 1, wherein the air content of the sample fluid is related to the sample volume change minus the base volume change.

14. The method of claim 1 further comprising calculating an accumulated air content of more than one sample fluids over a period of time.

15. The method of claim 14 further comprising comparing the accumulated air content to a predetermined value.

16. The method of claim 1, wherein the determining of the base volume change comprises determining a median base volume change with more than one sample of an infusion fluid.

17. The method of claim 16, wherein the determining of the median base volume change comprises determining a median base volume change with 11 contiguous samples of an infusion fluid.

18. The method of claim 16, wherein the sample fluid is a sample of the infusion fluid.

19. A method of determining pressure of a sample fluid comprising:

connecting the sample fluid to a chamber, wherein the chamber has an inlet valve, an outlet valve, and an assembly connected to a pressure source which pumps a chamber fluid

out of the chamber, and wherein the sample fluid is connected to the chamber fluid through the outlet valve; and

determining chamber pressure when the pressure of the sample fluid equals the chamber pressure.

20. The method of claim 19, wherein the sample fluid is a body fluid of a mammal.

21. The method of claim 20, wherein the body fluid is blood.

22. The method of claim 20, wherein the body fluid is blood in a vessel selected from the group consisting of artery, vein, and capillary.

23. The method of claim 20, wherein the mammal is a human.

24. The method of claim 19, wherein the chamber is part of an infusion pump.

25. The method of claim 24, wherein the chamber fluid is an infusion fluid.

26. The method of claim 19, wherein the inlet valve of the chamber is closed when the pressure source pushes the chamber fluid out of the chamber.

27. The method of claim 19, wherein the assembly comprises a cassette piston.

28. The method of claim 19, wherein the pressure source comprises a motor which generates a negative pressure in the chamber and pumps the chamber fluid into the chamber, and a spring which generates a positive pressure and pumps the chamber fluid out of the chamber .

29. The method of claim 27, wherein the determination of the chamber pressure includes determining position of the piston.

30. The method of claim 28, wherein the determination of the position of the piston includes using an optical position sensor.

31. The method of claim 19 further comprising monitoring the pressure of the sample fluid including determining the pressure of the sample fluid at more than one time point over a period of time.

32. The method of claim 19 further comprising comparing the pressure of the sample fluid to a predetermined value.

33. An apparatus for air content measurement of a sample fluid comprising:

a central chamber;

an assembly moving in and out of the central chamber;

a pressure source connected to the assembly, and wherein the pressure source comprises a motor which generates a negative pressure in the central chamber and pumps fluid into the central chamber via the assembly, and a spring which generates a positive pressure in the central chamber and pumps fluid out of the central chamber via the assembly;

a position sensor connected to the assembly, wherein the position sensor determines a position change of the assembly; and

a processor connected to the position sensor, wherein the processor receives the position change of the assembly, calculates a base volume change between zero or a negative pressure and a positive pressure in the central, and a sample volume change between zero or a negative pressure and the positive pressure in the central chamber with a sample fluid, wherein the air content of the sample fluid is related to the sample volume change minus the base volume change.

34. The apparatus of claim 33, wherein the assembly is a cassette piston.

35. The apparatus of claim 33, wherein the central chamber comprises an inlet valve and an outlet valve.

36. The apparatus of claim 35, wherein the inlet valve and the outlet valve are closed when the pressure source generates positive pressure.

37. The apparatus of claim 33, wherein the central chamber is part of an infusion pump.

38. The apparatus of claim 33, wherein the position sensor is an optical position sensor.

39. The apparatus of claim 33, wherein the processor further compares the air content to a predetermined value.

40. The apparatus of claim 39 further comprising an alarming device connected to the processor, wherein the processor activates the alarming device when the air content equals or is beyond the predetermined value.

41. The apparatus of claim 40, wherein the processor prevents fluid from leaving the central chamber when the air content equals or is beyond the predetermined value.

42. The apparatus of claim 41 further comprising an outlet valve controlling fluid flow out of the central chamber, wherein the processor closes the outlet valve and turns off the motor when the air content equals or is beyond the predetermined value.

43. The apparatus of claim 33, wherein the processor calculates the air content at different time points and generates an accumulated air content over a period of time.

44. The apparatus of claim 43, wherein the processor further compares the accumulated air content with a predetermined value.

45. The apparatus of claim 44 further comprising an alarming device connected to the processor, wherein the processor activates the alarming device when the accumulated air content equals or is beyond the predetermined value.

46. The apparatus of claim 45, wherein the processor prevents fluid from leaving the central chamber when the accumulated air content equals or is beyond the predetermined value.

47. The apparatus of claim 46 further comprising an outlet valve controlling fluid flow out of the central chamber, wherein the processor closes the outlet valve and turns off the motor when the accumulated air content equals or is beyond the predetermined value.

48. The apparatus of claim 33, wherein the processor calculates the base volume change by calculating a median base volume change of more than one sample of an infusion fluid.

49. The apparatus of claim 48, wherein the processor calculates the base volume change by calculating a median base volume change of 11 contiguous samples of an infusion fluid.

50. The apparatus of claim 48, wherein the sample fluid is a sample of the infusion fluid.

51. An apparatus for monitoring pressure of a sample fluid comprising:

a central chamber with an outlet valve, wherein a sample fluid is connected to a chamber fluid in the central chamber through the open outlet valve;

an assembly moving in and out of the central chamber;

a pressure source connected to the assembly, and wherein the pressure source comprises a motor which generates a negative pressure in the central chamber and pumps fluid into the central chamber via the assembly, and a spring which generates a positive pressure in the central chamber and pumps fluid out of the central chamber via the assembly;

a position sensor connected to the assembly, wherein the position sensor determines a position change of the assembly; and

a processor connected to the position sensor, wherein the processor receives the position change of the assembly and calculates pressure of the central chamber when the pressure of the sample fluid equals the pressure of the central chamber.

52. The apparatus of claim 51, wherein the processor further compares the pressure of the sample fluid to a predetermined value.

53. The apparatus of claim 52 further comprising an alarming device connected to the processor, wherein the processor activates the alarming device when the pressure of the sample fluid equals or is beyond the predetermined value.

54. The apparatus of claim 52, wherein the processor prevents the fluid from leaving the central chamber when the pressure of the sample fluid equals or is beyond the predetermined value.

55. The apparatus of claim 54, wherein the processor closes the outlet valve and turns off the motor when the pressure of the sample fluid equals or is beyond the predetermined value.